JUICE EXTRACTOR WITH ORIFICE TUBE BEAM MOVABLE BETWEEN OPERATING AND MAINTENANCE POSITIONS AND ASSOCIATED METHODS

Field of the Invention

[0001] This invention relates to the field of juice extractors and, more particularly, to the field of maintenance for juice extractors and related methods.

Background of the Invention

[0002] A known FMC Technologies juice extractor is disclosed in U.S. Patent No. 2,649,730 to Hait, and assigned to the present assignee, the disclosure of which is hereby incorporated by reference in its entirety. In this vertically arranged juice extractor, upper and lower cups support a fruit, vegetable or similar product. The sides of both upper and lower cups have fingers that interdigitate together. The upper cup descends into the lower cup against the fruit or vegetable and is pressed against a circular, lower cutter positioned at the top of a strainer tube adjacent the lower cup and an upper cutter positioned in the upper cup. Plugs are cut into the top and bottom portions of the fruit as the

interdigitating fingers of the two cups mesh together. Inner portions of the fruit, such as the pulp and juice, are forced down into the strainer tube positioned within a manifold.

[0003] An orifice tube moves upward in the strainer tube and applies pressure into the internal portion of the strainer tube to separate juice and pulp within the strainer tube. Juice and juice sacks flow through holes of the strainer tube into a juice manifold. Those internal portions of the fruit having particle sizes larger than the holes in the strainer tube are forced through a discharge opening in the orifice tube and then discharged.

[0004] The juice extractor disclosed in the Hait '730 patent includes a pair of drive members, an orifice tube beam that is slidable along the drive members, and an end member carried by lower ends of the drive members. More specifically, the orifice tube beam is moveable between an upper operating position and a lower maintenance position. When in the upper operating position, the weight of the orifice tube beam is supported by hinged arms that, in turn, include lower ends carried by the end member. During operation, the force generated by the reciprocal movement of the drive members may result in fatigue and failure of the end member near the hinges. A similar juice extractor is disclosed in U.S. Patent No. 2,780,988 to Belk et al.

[0005] Another shortcoming of this prior juice extractor is that a handle to move the orifice tube beam between lower and upper positions relies on rotation of the lower end member to thereby cause movement of the

hinges. This may not give sufficient leverage to a technician.

Summary of the Invention

[0006] In view of the foregoing background, it is therefore an object of the present invention to provide a juice extractor having greater reliability and/or that is more easily moved between lower and upper positions.

[0007] These and other objects, features, and advantages of the present invention are provided by a juice extractor comprising orifice tube beam locks to selectively lock an orifice tube beam to medial portions of respective drive members. More specifically, the juice extractor may comprise pairs of opposing cups being relatively movable for squeezing fruit therebetween, a pair of drive members extending along opposite sides of the pairs of opposing cups, and a plurality of strainer tubes associated with respective pairs of opposing cups.

[0008] The juice extractor may also comprise an orifice tube beam having opposing ends slidable along medial portions of respective drive members, and a plurality of orifice tubes extending from the orifice tube beam for reciprocal movement within respective strainer tubes. The pair of orifice tube beam locks may be included to selectively lock the orifice tube beam to the medial portions of the respective drive members.

[0009] Each of the drive members may have a recess at a medial portion thereof. Each of the orifice tube beam locks may comprise at least one key member and a lock handle cooperating therewith for moving the key member between a locked position engaged within the

recess and an unlocked position disengaged from the recess.

[0010] Each drive member may further comprise a respective stop above the end of the orifice tube beam. The recess and the key member may have cooperating inclined portions to preload the orifice tube beam against the stop when the key member is moved from the unlocked position to the locked position.

[0011] Each of the orifice tube beam locks may further comprise a tubular body surrounding the medial portion of a respective drive member, a pair of spaced apart flanges carried by the tubular body, and a U-shaped bracket transversely slidable on the tubular body between the spaced apart flanges. The U-shaped bracket may carry a key member. Each orifice tube beam lock may also comprise a cam rotatably carried by opposing ends of the U-shaped bracket and connected to the lock handle. The juice extractor may also include an adjustable spacer associated with each orifice tube beam lock.

[0012] The juice extractor may still further comprise an end member connected between opposing ends of the pair of drive members, and a lift assist connected between the end member and the orifice tube beam for moving the orifice tube beam between a lower maintenance position and an upper operating position.

[0013] The lift assist may comprise a pair of hinges extending between the end member and the orifice tube beam, and at least one spring connected to the hinges to urge the orifice tube beam to the upper operating position. This advantageously decreases the load that an operator would normally lift to move the orifice tube beam to the upper position.

[0014] Each hinge may comprise a lower arm having a lower end pivotally mounted to the end member. Each hinge may further comprise an upper arm having an upper end pivotally connected to the orifice tube beam, and a lower end pivotally connected to a medial portion of the lower arm. The lift assist may also comprises a lift assist handle connected between upper ends of the lower arm.

[0015] A method aspect of the present invention is for selectively locking an orifice tube beam of the juice extractor described above in an operating position. The method may comprise selectively locking a pair of orifice tube beam locks to medial portions of the drive members to thereby selectively lock the orifice tube beam in the operating position.

[0016] Another method aspect of the present invention is for moving an orifice tube beam of a juice extractor, as described above, between a lower maintenance position and an upper operating position. The method may comprise installing a lift assist to the juice extractor, and grasping and raising the lift assist handle to move the orifice tube beam from the lower maintenance position to the upper operating position.

Brief Description of the Drawings

[0017] FIG. 1 is front elevation view of a juice extractor according to the present invention.

[0018] FIG. 2 is a perspective view of a portion of the juice extractor shown in FIG. 1 with an orifice tube beam in the upper position, and a lock handle in the locked position.

[0019] FIG. 3 is a perspective view of a portion of the juice extractor shown in FIG. 1 with the orifice tube beam in the upper position, and the lock handle in the unlocked position.

[0020] FIG. 4 is a perspective view of the juice extractor shown in FIG. 1 with the orifice tube beam being moved to a lower position.

[0021] FIG. 5 is a front elevational view of an orifice tube beam lock on a drive member of the juice extractor shown in FIG. 1.

[0022] FIG. 6 is an exploded side perspective view of the orifice tube beam lock shown in FIG. 5.

[0023] FIG. 7 is a fragmentary perspective view of a lock handle in the locked position adjacent an orifice tube beam lock of the juice extractor shown in FIG. 1.

[0024] FIGS. 8A-8B are side elevational views of the orifice tube beam lock shown in FIG. 7 having the lock handle in the locked position with the orifice tube beam lock being engaged (FIG. 8A) and being moved to the unlocked position with the orifice tube beam lock being disengaged (FIG. 8B).

[0025] FIGS. 9A-9C are lateral cross-sectional views through the center of the orifice tube beam lock of the juice extractor shown in FIG. 1 during stages of locking.

[0026] FIGS. 10A-10C are longitudinal cross-sectional views of the orifice tube beam lock shown in FIGS. 9A-9C taken through lines 10A—10A, 10B-10B, and 10C-10C, respectively.

Detailed Description of the Preferred Embodiments

[0027] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0028] Referring initially to FIG. 1, a juice extractor **15** according to the present invention is now described. The juice extractor **15** illustratively includes a pair of orifice tube beam locks **30** to lock an orifice tube beam **24** along medial portions of drive members **20**. Accordingly, the orifice tube beam locks **30** of the juice extractor **15** are advantageous in sustaining the load of the orifice tube beam **24** when reciprocated in an upper operating position. The juice extractor **15** also illustratively includes a lift assist **50** for moving the orifice tube beam **24** between a lower maintenance position and the upper operating position.

[0029] The juice extractor **15** also illustratively includes pairs of opposing cups **17** that are relatively movable for squeezing fruit therebetween. The juice extractor **15** further includes a pair of drive members **20** extending along opposite sides of the pairs of opposing cups **17**, and a plurality of strainer tubes (not shown) associated with the opposing cups.

[0030] The juice extractor **15** also comprises an orifice tube beam **24** having opposing ends slidable along

medial portions of the drive members **20**, and a plurality of orifice tubes **26** extending from the orifice tube beam for reciprocal movement within the strainer tubes. Accordingly, after fruit has been squeezed between the opposing cups **17**, juice is passed through the strainer tubes and collected in a manifold (not shown).

[0031] Turning now additionally to FIGS. 2-4, the lift assist **50** of the juice extractor **15** is now described in more detail. An end member **52** is illustratively connected between opposing ends of the pair of drive members **20**. The lift assist **50** is connected between the end member **52** and the orifice tube beam **24** for moving the orifice tube beam between a lower maintenance position (FIG. 4) and an upper operating position (FIG. 3). The lift assist **50** comprises a pair of hinges **54a, 54b** extending between the end member **52** and the orifice tube beam **24**, and springs **56** connected to the hinges to urge the orifice tube beam to the upper operating position.

[0032] Each of the hinges **54a, 54b** includes a lower arm **55a, 55b** having a lower end pivotally mounted to the end member **52**. The hinges **54a, 54b** also includes upper arms **57a, 57b** having upper ends pivotally connected to the orifice tube beam **24**, and lower ends pivotally connected to a medial portion of the lower arms. The lift assist **50** further comprises a lift assist handle **58** connected between upper ends of the lower arms **55a, 55b**. The lift assist **50** does not rely on rotation of the end member **52** as in the prior art. Rather, lifting and locking of the hinges **54a, 54b** is more efficiently provided in accordance with this aspect of the extractor **15**.

[0033] Turning now additionally to FIGS. 5-10c, the orifice tube beam locks **30** of the juice extractor **15** of the present invention are now described in greater detail. The pair of orifice tube beam locks **30** are for selectively locking the orifice tube beam **24** to the medial portions of the respective drive members **20**. The configuration of the orifice tube beam locks **30** advantageously allow the orifice tube beam **24** to be supported along the medial portion of the drive members **20** when in the upper position.

[0034] Each of the drive members **20** illustratively has a recess **21** at the medial portion thereof. Each of the orifice tube beam locks **30** comprises key members **32a, 32b**, and a lock handle **34** associated therewith. The lock handle **34** is moveable between a locked position (FIG. 8A) and an unlocked position (FIG. 8B). The lock handle **34** cooperates with the key members **32a, 32b** to move the key members between a locked position, engaged within the recess **21** (FIG. 8A), and an unlocked position, disengaged from the recess (FIG. 8B).

[0035] Each drive member **20** comprises a stop **28** (FIG. 6) above the end of the orifice tube beam **24**. The recess **21** and the key members **32a, 32b** have cooperating inclined portions to preload the orifice tube beam **24** against the stop **28** when the key members are moved from the unlocked position to the locked position.

[0036] The orifice tube beam lock **30** is now discussed in greater detail with reference to the exploded view illustrated in FIG. 6. and the cross sectional views illustrated in FIGS. 9A-10C. Each of the orifice tube beam locks **30** comprises a tubular body **35**

surrounding the medial portion of a respective drive member **20**. The tubular body **35** illustratively comprises a pair of spaced apart flanges **36** along a medial portion thereof. A pair of opposing key member passageways **31a, 31b** are formed in a medial portion of the tubular body **35** between the flanges **36**. The orifice tube beam locks **30** also illustratively comprise a U-shaped bracket **37** transversely slidable on the tubular body **35** and carrying a key member **32a**.

[0037] The U-shaped bracket **37** comprises a pair of opposing legs **38** and a bight portion **39**. The key member **32a** is carried by an interior surface of the bight portion **39** of the U-shaped bracket **37** and engages the key member passageway **31a** formed in the tubular body **35**. The pair of opposing legs **38** slidably engage the tubular body **35** along a space defined by the spaced apart flanges **36**.

[0038] The U-shaped bracket **37** also includes a bracket key-support member **45** that is connected between the legs **38** of the U-shaped bracket **37** opposite the bight portion **39**. The bracket key-support member **45** carries a key member **32b** that engages the key member passageway **31b** formed in the tubular body **35**. The bracket key-support member **45** further comprises a pair of pin receiving passageways **33** formed therein.

[0039] Likewise, each of the opposing legs **38** has a pin receiving passageway **41** formed therein for receiving a pair of pins **46**. Accordingly, the pins **46** may be inserted through the pin receiving passageways **41** on the legs **38** of the U-shaped bracket **37** and through the pin receiving slots **33** on the bracket key-support member **45** to hold the key-support between the opposing legs of the U-shaped bracket.

[0040] A cam **40** is rotatably carried by the opposing ends of U-shaped bracket **37** and, more specifically, between the opposing legs **38** of the U-shaped bracket. The cam **40** is also illustratively connected to the lock handle **34**. The U-shaped bracket **37** has a cam pin receiving passageway **42** formed in each of the opposing legs **38**. Likewise, the cam **40** has a corresponding cam pin receiving passageway **43** formed therein. The cam **40** is fixed between the opposing legs **38** of the U-shaped bracket **37** by inserting a cam pin **44** through the respective cam pin receiving passageways **42**, **43**.

[0041] A spacer **48** is illustratively positioned on the tubular body **35** and between the orifice tube beam lock **30** and the orifice tube beam **24**. This spacer **48** allows adjustment of the lock as will be appreciated by those skilled in the art. A collar **49** is illustratively fixed to an end of the orifice tube beam **24** adjacent the spacer **48**.

[0042] A method aspect of the present invention is for selectively locking an orifice tube beam **24** in an operating position of a juice extractor **15**. The method comprises selectively locking a pair of orifice tube beam locks **30** to medial portions of the drive members **20** to thereby selectively lock the orifice tube beam **24** in the operating position.

[0043] Another method aspect of the present invention is for moving an orifice tube beam **24** of a juice extractor **15** between a lower maintenance position and an upper operating position. The method comprises installing a lift assist **50** to the juice extractor **15**, and grasping and raising the lift assist handle **58** to

move the orifice tube beam **24** from the lower maintenance position to the upper operating position.

[0044] Many modifications and other embodiments of the invention will come to the mind of one skilled in the art having the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed, and that other modifications and embodiments are intended to be included within the scope of the dependent claims.